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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/024,827	12/17/2001	Shoshi Yasunaga	1488.00008	5445

7590

04/07/2003

WOOD, PHILLIPS, VAN SANTEN, CLARK & MORTIMER
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EXAMINER

THAI, LUAN C

ART UNIT

PAPER NUMBER

2827

DATE MAILED: 04/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary**Application No.**

10/024,827

Applicant(s)

YASUNAGA ET AL.

Examiner

Luan Thai

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 5) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 6) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Embodiment II (Figures 12-15), in Paper No. 4 is acknowledged.

Priority

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d).

Oath/Declaration

3. The declaration filed 12/17/01 is acceptable.

Claim Objections

4. Claims **2** and **21** are objected to because of the following informalities:
The limitation "the base" in claims **2** and **21** (line 2) should be changed to --the support--.
Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 3, 9-10, 15-16, 20, 22, 28-29, 34-35 and 40 are rejected under 35 U.S.C. 102(e) as being anticipated by Bayan et al (6,483,180).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 1, 15, 20, 34 and 40, Bayan et al (see specifically figures 2A-2B-3 and 5A-5B-5C attached, and Col. 3, lines 19+, lines 43-67, Col. 4, lines 1-60, Col. 5, lines 9-51) disclose a semiconductor assembly comprising:

A) a lead frame comprising: a sheet 20 having oppositely facing sides and a thickness between the oppositely facing sides, the sheet 20 comprising first and second unit lead frames (A-B) (see figures 2A-2B), each unit lead frame comprising a support 16 for a semiconductor chip 22 and a plurality of leads 12 spaced from the support 16, the sheet 20 further comprising a tie bar network (24/24') which connects a) the support 16 to the leads 12 on each of the first and second unit lead frames and b) the first and second unit lead frames each to the other, the sheet having a dividing line 28 along which the sheet can be cut to separate the first and second unit lead frames from each other, the tie bar network comprising at least one tie bar 24 extending along a substantial length of the dividing line 28, the support 16 having a first thickness (equal to the thickness 25 of the leads 12, see figure 2C) between the oppositely facing sides of the sheet, the at least one tie bar 24 having a second thickness 25' (see figure 5B attached) between the oppositely facing sides of the sheet over a substantial

length of the dividing line 28 that is less than the first thickness 25, and each of leads 12 having a portion with a thickness being less than the first thickness 25 (see figures 2B and 5B); B) a first and a second semiconductor chips 22 applied to the support 16 on the first and second unit lead frames, respectively; C) conductive elements 26 (e.g., wiring 26) electrically connecting the first and the second chips 22 to the leads 12 on the first and second unit lead frames (see figure 2B); a resin layer 18 applied over one of the oppositely facing sides of the sheet so as to be applied to the first and second semiconductor chips 22 and the conductive elements 26 (e.g., wirings 26).

Regarding claims 3 and 22, Bayan et al further disclose (see specifically figures 2A-2B) the first unit lead frame (A) having: a corner (X), and the tie bar network comprising a support tie bar assembly comprising at least one support tie bar 24' that extends from the support 16 on the first unit lead frame (A) towards the corner (X).

Regarding claims 9 and 28, Bayan et al further disclose (see specifically figures 2A-2B and 3) each of leads 12 on the first and second unit lead frames having an undercut formed therein.

Regarding claims 10 and 29, Bayan et al further disclose (see specifically figures 2A-2B) the first and second unit lead frames (A-B) each have a rectangular shape with a peripheral edge defined by first, second, third and fourth peripheral edge portions (24); the support 16 on the first unit lead frame having a rectangular shape defined by first, second, third and fourth outer edges L-M-N-O

respectively, the first, second, third and fourth peripheral edge portions (24) being substantially parallel to the first, second, third, and fourth outer edges L-M-N-O, wherein the plurality of leads 12 are between the first peripheral edge portion 24 and the first outer edge L, the second peripheral edge portion 24 and the second outer edge M, the third peripheral edge portion 24 and the third outer edge N, and the fourth peripheral edge portion 24 and the fourth outer edge O.

Regarding claims 16 and 35, Bayan et al further disclose the at least one of the oppositely facing sides being formed by etching (Col. 3, lines 56+).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2, 4-5, 11-14, 17-19, 21, 23-24, 30-33 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bayan et al (6,483,180) in view of Hong et al (6,448,107).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 2 and 21, Bayan et al disclose the support 16 having the first thickness 25 and the at least one tie bar 24 having the second thickness 25' over a substantial length of the dividing line 28 that is less than the first thickness 25, as detailed above (see figure 5B attached). Bayan et al, however, fail to

disclose the second thickness 25' being less than the first thickness 25 over *substantially the entire length of the dividing line.*

Hong et al while related to a similar semiconductor assembly design disclose a conventional assembly (see specifically figures 1A-1B-1C and 1D attached, and Col. 1, lines 10+) comprising: the support 107 having a first thickness (see figure 1D) between the oppositely facing sides of the lead frame sheet 101, the at least one tie bar 111 having a second thickness (see figures 1D and 1C) between the oppositely facing sides of the sheet that is less than the first thickness *over substantially the entire length of the dividing line that is along the tie bar 111.* It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bayan et al lead frame by forming the tie bar 24 having the second thickness to be less than the first thickness *over substantially the entire length of the dividing line that is along the tie bar,* in order to reduce the weight and thus, the production cost of the assembly, and such modification is held to be within the ordinary designing ability expected of a person skilled in the art.

Regarding claims 4-55, 14, 23-24 and 33, Bayan et al disclose all the limitations of the claimed invention as detailed above except for the first unit lead frame having first and second peripheral tie bars that meet at the corner and the support tie bar assembly branches away from the support on the first unit lead frame to define a first support tie bar that extends to the first peripheral tie bar and a second support tie bar that extends to the second peripheral tie bar, and

the support tie bar assembly 24' having a thickness less than the first thickness of the support 16.

Hong et al while related to a similar semiconductor assembly design teach (see specifically figures 2A-2B and 5-6-7 attached, and Col. 3, lines 43-67, Col. 4, lines 1-30, Col. 5, lines 44-67 and Col. 6, lines 1-13) a first unit lead frame 12 having first and second peripheral tie bars 18 that meet at the corner (Y) (see figure 2B) and the support tie bar assembly 19(51), which may have a Y shape as shown in figures 5 and 7, branches away from the support 14 on the first unit lead frame to define a first support tie bar 52 that extends to the first peripheral tie bar 18 and a second support tie bar 52 that extends to the second peripheral tie bar 18 (Col. 5, lines 44-65), and the support tie bar assembly 51 having a length and a thickness that is less than the first thickness of the support 14 over the length of the support tie bar assembly 51. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bayan et al lead frame by forming the support tie bar assembly having a thickness less than the first thickness of the support *over the length of the support tie bar assembly*, in order to reduce the weight and the production cost of the assembly, and such modification is held to be within the ordinary designing ability expected of a person skilled in the art.

Regarding claims 11 and 30, Bayan et al disclose all the limitations of the claimed invention as detailed above except for a border rail to be connected to a peripheral edge portion of the first unit lead frame (A) by the tie bar network.

A sheet of a lead frame comprising a border rail for connecting plurality of unit lead frames via the tie bar network, however, is common in the art, specifically in lead frame art, as taught by Hong et al (see the border rail 112 and the tie bar network 111 in figures 1A-1B-1C-1D attached). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form Bayan et al's lead frame sheet to have a border rail for connecting plurality of unit lead frames via the tie bar network.

Regarding claim 12-13 and 31-32, Hong et also disclose (see figures 1A-1B-1C-1D) the sheet 101 having a second dividing line along the peripheral edge along which the sheet can be cut to separate the first unit lead frame from at least part of the border rail 112 (see figure 1B), and the tie bar network comprising at least a second tie bar 111 extending along a substantial length of the second dividing line, and the leads 109 on the first unit lead frame and the tie bar network 111 being sufficiently symmetrical at the first and second sides of the second dividing line that resistance to cutting along the second dividing line at the first and second sides to be substantially the same. Thus, the further citations (e.g., the thickness of the tie bar being less than the thickness of the support) in claims 12-13 and 31-32 would have been obvious over Bayan et al in view of Hong et al for the similar reasons set forth in the discussion of claims 2, 5, 21 and 24 above.

Regarding claim 17-19 and 36-38, Hong et further disclose (see figures 1A-1B-1C-1D) the sheet 101 having the border rail 112, the tie bar

network 111 and the leads 109 extending continuously around the first unit lead frame so as to connect the first unit lead frame to a) the second unit lead frame, b) the border rail 112 and c) at least a third unit lead frame, and the tie bar network 111 having at least a portion with a thickness less than the first thickness of the support 107 (as detailed above) and extending substantially fully around the peripheral edge of the first unit lead frame. Thus, the further citations (e.g., the thickness of the tie bar being less than the thickness of the support) in claims 17-19 and 36-38 would have been obvious over Bayan et al in view of Hong et al for the similar reasons set forth in the discussion of claims 2, 5, 21 and 24 above.

Regarding claim 39, it should be noted that although claim 39 is "method claim", the method steps consist of the broad steps of "providing...., forming...., cutting.....etc.", therefore these steps would be inherently satisfied by the apparatus of the references as modified.

9. Claims 6-8 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bayan et al (6,483,180) in view of Kajihara et al (5,378,656).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 6-8 and 25-27, Bayan et al disclose all the limitations of the claimed invention as detailed above except for the support tie bar having an elongate opening therethrough.

The support tie bar having an elongate opening therethrough, however, is commonly applied in the art, specifically in lead frame art, as taught by Kajihara

et al (see the support tie bar 4 in figures 1-2, 4, 6, 8, 12-13, 15-16, 21, 23). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Bayan et al's assembly by forming the support tie bar having an elongate opening therethrough, as taught by Kajihara et al, in order to improve the bonding strength between the sealing resin and the support tie bar, and such modification is held to be within the ordinary designing ability expected of a person skilled in the art.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan Thai whose telephone number is (703) 308-1211. The examiner can normally be reached on 7:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703) 305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Luan Thai
April 4, 2003